



Chemical Pneumonitis and Acute Dyspnea Following Exposure to Tribenuron Methyl

Tribenuron Metil Maruziyetine Bağlı Gelişen Akut Nefes Narlığı ve Kimyasal Pnömoni

Kimyasal Pnömoni / Chemical Pneumonitis

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Özet

Daha öncesinde sağlıklı olan 48 yaşında bir erkek hasta, herbisit ajanlardan tribenuron metil kullanımı sonrası gelişen akut nefes darlığı ve pnömoni tablosuyla kliniğimize başvurdu. Toksik madde maruziyeti, doğada yeterli güvenlik önlemi alınmadan yapılan tarım ilaçlaması esnasında olmuştur. Hasta metil prednizolon, inhale steroid ve beta-2 kombinasyonu tedavisiyle tamamen iyileşti. Bu olgu nedeniyle herbisit maruziyetine bağlı gelişen akut dispne ve kimyasal pnömoninin klinik bulguları ve ayırıcı tanısı tartışıldı.

Anahtar Kelimeler

Hipersensitivite; İnhalasyon; Pnömoni; Toksikite

Abstract

A previously healthy 48-year-old man admitted to our clinic with an acute dyspnea and pneumonia like illness following use of a tribenuron methyl containing herbicide agent. Exposure was inhalational in nature during agricultural spraying without implementing the precautions. The patient completely recovered by methyl prednisolone, inhaler corticosteroid and long acting beta-2 agonist combination therapy. For this case, the differential diagnosis of chemical pneumonitis and acute dypnea from inhalational exposure to herbicide and clinical findings are discussed.

Keywords

Hypersensitivity; Inhalation; Pneumonitis; Toxicity

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Introduction

Herbicide and pesticide poisonings among farmers and occupational workers in developing countries are alarming primarily because of unsafe applications and handling practices [1]. WHO estimated approximately 20000 deaths among workers from exposure to agricultural chemicals every year, the majority in developing countries [2]. Tribenuron methyl (Vhashi™ 75 DF, China) is a member of the sulfonylurea herbicide characterised by low application rates and high phytotoxicity. It is used for weed control in cereals and other crops and are highly active against a wide range of broad leaved weeds [3]. It has been registered in many countries including Turkey. However, its toxic effects on humans are not well known and reported as unharmed to human health previously [4]. We describe a case of chemical pneumonitis following use of a herbicide agent containing tribenuron methyl. To our knowledge, pulmonary injury associated with use of tribenuron methyl inhalation has not been reported.

Case Report

A forty eight year old, previously healthy farmer male referred to our clinic with an initial diagnosis of community acquired pneumonia and acute asthma like disease. His complaints were dyspnea, cough with purulent sputum and high fever ongoing for a week. He also smoked 1.5 packs of cigarettes a day for 20 years. There was a history of 2 days working in agriculture and exposing to a herbicide, tribenuron methyl, by inhalatory route without using any protective mask. A detailed composition obtained from the manufacturer was 75% tribenuron-methyl formulated as [Methyl 2-[4-methoxy-6 methyl-1,2,3-triazin-2-yl (methyl) carbamoylsulfamoyl] benzoate]. His heart rate was 92 beats/min; blood pressure 120/70 mmHg; respiratory rate 23 breaths/min; and pulse oximetry indicated 96% saturation, fever was 37.1 centigrade degrees, Bilateral wheezing was heard during auscultation. Patchy infiltrations were determined in chest x-ray graph. Thoracic computed tomography revealed bilateral mediastinal lymphadenopathies, diffuse and irregular ground glass opacities, fibrotic changes and multiple subpleural nodules (figure 1). Spirometric results were documented dur-

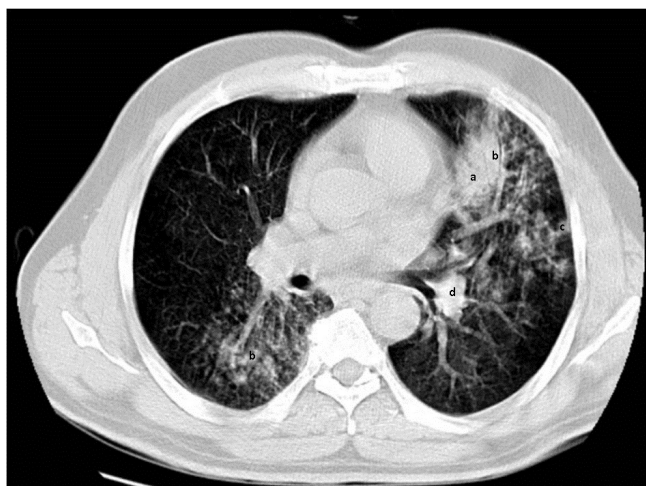


Figure 1. Computed tomography reveals diffuse and irregular opacities (A), air bronchograms (B), subpleural nodules (C) and interlobar lymphadenopathy (D).

ing admission to our clinic as follows; FVC: 3.08 liter (68.9%), FEV1: 2.58 liter (70.6%), FEV1/FVC: 83.8%, PEF: 6.28 liter/min

(72.3%) and FEF 25-75 value was 2.69 (70.5%) liter. Bronchial lavage and transbronchial biopsy was performed from the inferior segment of the lingula having hyperemic and edematous mucosa with the aim of fiberoptic bronchoscopy. Lymphocytic infiltration and granulomatous reactions were reported by cytologic examination of the specimens. The patient was treated by methyl prednisolone (1mg/kg), budesonide (inhaler corticosteroid, 400 microgram/day) and formoterol (long acting beta-2 agonist, 24 microgram/day). Clinical, spirometric and radiological improvements (figure 2) were achieved and his asthmatic symptoms are almost totally regressed after two weeks of the therapy. Chest x-ray graph and pulmonary functions of the patient were detected as completely normal during second control after two months from exposure.

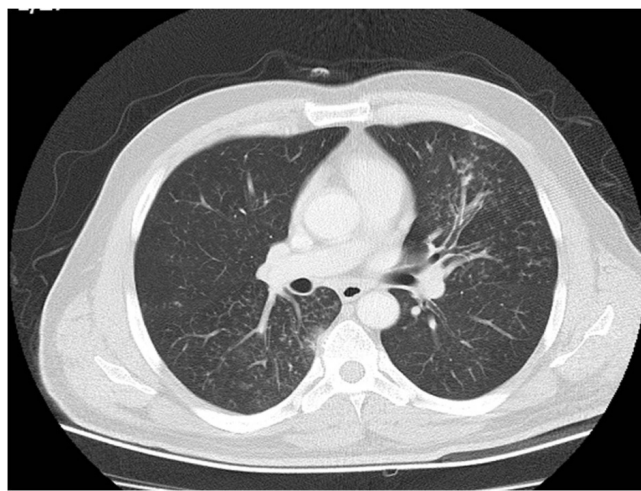


Figure 2. Pulmonary lesions completely recovered after corticosteroid treatment as seen in computed tomography.

Discussion

Herbicides and pesticides are used extensively throughout the world and are playing a pivotal role in meeting the food demand of escalating population. The three major routes of entry to body for chemicals include contamination of the skin, lungs and the gut. The respiratory tract provides a very efficient surface for the absorption of substances, whether they are in the form of vapors, particles or droplets. Herbicide inhalations may cause subacute dyspnea and pneumonitis as presented here but this patient has some clinical similarities with hypersensitivity pneumonitis and reactive airway dysfunction syndrome (RADS). Exposure to chemicals may cause different clinical tables changing from mild irritation to severe parenchymal destruction in respiratory tract based on chemical structure of exposed material, duration and severity of exposure and sensitivity of the persons [1;2;5;6].

To summarize the case history, the patient experienced immediate irritant symptoms following use of a tribenuron methyl containing herbicide. Within 24 hours, he was documented to have cough, chest pain, blurry vision, vertigo and a diffuse irregular infiltrate on chest radiography. After 2 more days while on intravenous antibiotic therapy, his condition worsened with the development of dyspnea requiring oxygen support and bronchodilator therapy than the patient was referred to our clinic which is a tertiary hospital. Early bronchoscopy (day 4) showed the presence of diffuse bronchiolitis and granulomatous reactions. He recovered completely after treatment. Although it is

possible a biological or chemical agent other than herbicide caused the patient's pathology, herbicide remains the most likely causative factor for the patient was healthy and not afflicted by any pulmonary disease previously. Testing and cultures for a microbiological cause were negative, and he did not respond to antibiotic therapy. Physical examination is unlikely to be helpful in establishing the diagnosis of the patient: bibasilar crackles and wheezing is heard on auscultation of the lung. It does not show evidence of allergy such as prick test positivity, high IgE levels, and eosinophilia. Routine laboratory tests and specific serum precipitating antibodies are unhelpful to establish the diagnosis in present subject. Spirometric tests demonstrate restrictive changes with impaired DLCO being neither specific nor diagnostic for hypersensitivity pneumonitis. Arterial blood gases and diffusion values can be impaired in the early stage of diffuse parenchymal lung diseases [7].

The findings of patchy pneumonic infiltrations on chest x-ray graphy, ground glass appearance in high resolution thorax computed tomography, airway obstructions followed by exogenous exposure to toxic gas, lymphocytic infiltration and granulomatous reaction are same in subacute form of hypersensitivity pneumonitis and resembles RADS [7].

Hypersensitivity pneumonitis or extrinsic allergic alveolitis is an immunologically induced lung disease caused by repeated inhalation of agents in sensitized individuals and a rare cause of diffuse parenchymal lung disease [8]. The diagnosis of hypersensitivity pneumonitis can be established by clinical, radiological and bronchoalveolar lavage fluid findings. The characteristic pattern of the high resolution computed tomography is the presence of ground glass shadowing, bilateral micronodular infiltrates in diffuse parenchymal or interstitial lung diseases. Transbronchial biopsy by fiberoptic bronchoscopy or open lung biopsy may be required in patients with symptoms of insidious onset and that cannot be clearly related to any particular exposure. It may present with an extensive variety of clinical abnormalities depending on the nature of the inhaled antigens, microorganisms, animal proteins, haptens formed on endogenous proteins or chemicals [9]. The most characteristic cell profile in bronchoalveolar fluid is of a lymphocytic alveolitis with a predominance of CD8 (+) T cells. RADS is defined as the persistent airway obstruction following an acute exposure to irritants such as chemicals, gases or heavy dusts. Inhalations cause acute and severe injury in airways. Symptoms of cough, dyspnea and wheezing starts suddenly, shows persistent character ongoing several years [6]. But spirometric and radiologic results of our patient were normal after the treatment.

In an experimental study it is stated that therapy with terbutaline and budesonide combination was associated with significant improvement in PaO₂ and lung compliance, as compared with placebo or treatment with either drug alone in acute chlorine gas induced lung injury [10]. We treated our patient with formoterol and budesonide combination and systemic corticosteroids as in acute asthma. The final results of respiratory function tests and radiologic controls showed the pulmonary improvements.

It can be hypothesized that the toxicity of inhaled herbicides may trigger severe inflammatory reactions and releasing some mediators in respiratory tract and cause a transient airway ob-

struction and interstitial lung disease. Subsequently, these reactions may cause clinical illness such as pneumonitis and bronchoconstriction or asthma like disease.

As a result, herbicide toxicity should be considered in the differential diagnosis of acute dyspnea and community acquired pneumonia in patients who work in agricultural occupations and a more careful history taking is important in diagnosis.

Competing interests

The authors declare that they have no competing interests.

References

1. Kesavachandran CN, Fareed M, Pathak MK, Bihari V, Mathur N, Srivastava AK. Adverse health effects of pesticides in agrarian populations of developing countries. *Rev Environ Contam Toxicol* 2009;200;33-52.
2. Kishi M, Hirschhorn N, Ojajadisastra M, Satterfee LN, Stroman S, Dilts R. Relationship of pesticide spraying to signs and symptom in Indonesian farmers. *Scand J Environ Health* 1995;21(2);124-33.
3. Andersen SM, Hertz PB, Holst T, Bossi R, Jacobsen CS. Mineralisation studies of ¹⁴C-labelled metsulfuron-methyl, tribenuron-methyl, chlorsulfuron and thifensulfuron-methyl in one Danish soil and groundwater sediment profile. *Chemosphere* 2001;45(6-7);775-82.
4. Hashmi I, Khan A. Adverse Health Effects of Pesticides Exposure in Agricultural and Industrial Workers of Developing Country. In: Margarita Stoytcheva, editor. *Pesticides-The Impacts of Pesticide Exposure*. Croatia: In Tech Rijeka; 2011.p.155-78.
5. Sertoğullarından B, Bora A, Sayır F, Ozbay B. Hydrocarbon pneumonitis; clinical and radiological variability. Doi: 10.4328/JCAM.869 published online 20.01.2012.
6. Robert PD, David AS. Acute and Chronic Responses to Toxic Inhalations. In: Fishman AP, editor. *Fishman's Pulmonary Diseases and Disorders*. New York: Mc Graw-Hill Book Company; 1998. p. 993-1009.
7. Kupeli E, Karnak D, Kayacan O, Beder S. Clues for the differential diagnosis of hypersensitivity pneumonitis as an expectant variant of diffuse parenchymal lung disease. *Postgrad Med J* 2004; 80(944): 339-45.
8. American Thoracic Society/European Respiratory Society. International Multidisciplinary Consensus Classification of the Idiopathic Interstitial Pneumonias. *Am J Respir Crit Care Med* 2002;165(2): 227-304.
9. Zacharisen MC. Idiopathic interstitial pneumonia: are we missing hypersensitivity pneumonitis? *Ann Allergy Asthma Immunol* 2002;88(1): 4-6.
10. Wang J, Zhang L, Walther SM. Administration of aerosolized terbutaline and budesonide reduces chlorine gas-induced acute lung injury. *J Trauma* 2004;56(4): 850-62.

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